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Abstract

GUIDE FOR THE HAZARDS EVALUATION OF A CHEMI-NUCLEAR INSTALLATION

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Experience acquired in operating nuclear installations shows that in spite of the potential hazards of this industry, its safety record ranks among the highest prevailing in the industrial field. This result has been achieved by the incomparable efforts made to recognize the hazards of nuclear installations, to avoid the occurrence of failures and accidents and to minimize the possible effects of an accident, should it occur.

The hazards evaluation study made prior to the construction and operation of a nuclear plant, which has been adopted as a standard procedure, is an example of the particular efforts made in the nuclear safety field.

The numerous reports published on the hazards evaluation of nuclear reactors as well as the guides for formulating them, e.g., that of Ablitt [1], enable recognition of the general safety problems encountered in their operation. However, only relatively few hazards evaluation reports have been published for chemi-nuclear plants, for example, those cited [2,3], despite the relatively high potential hazards entailed and their probability.

A study of the environmental hazards involved in the operation of a typical chemi-nuclear installation, based on the "maximum credible accident concept" is presented and compared with the environmental hazards of a nuclear reactor.

A review of accidents in nuclear plants [4] reveals that most of them occurred in chemi-nuclear installations. Also, because of the variety of safety problems encountered, the few hazards evaluation reports published for such installations cannot be used as a general guide.

In the present guide is discussed the general information required for a

hazards evaluation study of a chemi-nuclear installation, and which should be considered in planning the safety precautions for such plants. Consideration is given to two safety concepts: nuclear and chemical safety. Among the topics on which information is required for the hazards evaluation study are the following:

Site evaluation. Materials of construction and resistance of the installation to fire, pressure and shock waves. Auxiliary installations (ventilation, filtration, monitoring system, emergency systems, etc.). Study of the different processes (chemical, metallurgical), of the conditions of operation (temperature, pressure, etc.) and of the materials involved and their properties (e.g. radioactivity, pyrophority). Control system. Maintenance and operation. Storage, transportation and waste disposal. Shielding and containment. Personnel organisation and responsibilities. Possible accidents (fire, explosion, criticality, earthquake, etc.) and their consequences. Evaluation of hazards during normal and continuous operation and following accidents. Emergency procedures.

Special consideration is given to various features of chemi-nuclear plants which differentiate them from nuclear reactors from the safety standpoint, such as high volume specific activity of materials, presence of inflammable and explosive materials, variety of operations involved and the impossibility of providing the installations with the same degree of containment as in nuclear reactors.

REFERENCES

[1] ABLITT, J.F., Guide to safety report requirements: I. Stage I. Gas cooled graphite moderated reactors. UK AERE Report AHSB-41 (1960).

[2] WATCHER, J., Final safety evaluation of plutonium processing to be performed in the heavy element processing facility. USAEC Report MND-P-2396 (1960).

[3] Radioactive materials laboratory safety report. USAEC Report MND-2410 (1960).

[4] A summary of industrial accidents in USAEC facilities. USAEC Report TID-5360 Supp. 3 (Rev.) (1961).